

Hymenoptera, *Coeloides brunneri* Vierck on April 12. The emergence of bark- or wood-inhabiting insects continued through July 16, 1973. Although *C. brunneri* is primarily an ectoparasite on bark beetle larvae, it is sometimes associated with other larvae as well. Four adults of the hymenopteran *Atanycolus longifemoralis* Shenefelt emerged between May 7 and May 27. *A. longifemoralis* is a primary ectoparasite on both *M. drummondi* and *M. gentilis* (Shenefelt, 1943. Res. Stud. State Coll. Wash., 11: 51-163.).

Freshly emerged *Melanophila* adults were placed in cylindrical plastic containers for observation and were fed fresh ponderosa pine twigs and needles. Pine bark and wood chips were provided for the beetles to walk on. A small specimen vial cap was filled with tap water and placed in each container to supply moisture and drinking water. Nearly all individuals of both *M. drummondi* and *M. gentilis* fed on fresh ponderosa pine needles or twig phloem when needles became scarce.

In a feeding-choice experiment I found that adults of *M. drummondi*, reared from Douglas-fir, fed on needles of Douglas-fir, western hemlock, or ponderosa pine. However, closer examination of the needles of the three species revealed feeding to be greater on Douglas-fir than on the others. Although this evidence is by no means conclusive, it is conceivable that feeding preference is directly related to the host tree species in which the brood develops.—DONALD W. SCOTT, *College of Forest Resources, University of Washington, Seattle, 98195.*

Tolerance of *Neotoma* and *Rattus* to the Feeding of *Triatoma*.—Evidence is accumulating that wild rodents can tolerate feedings of large numbers of blood sucking triatomid bugs without lethal effects. These hematophagous insects normally inhabit the houses of wood rats, *Neotoma*, with associated species of white-footed mice, *Peromyscus*. Wood (1943, Am. J. Trop. Med. 23:315-320) reported survival of an adult ♀ *Neotoma a. albigula* after 14 feedings by a total of 1016 *Triatoma* during 168 days of laboratory confinement. The maximum number of bugs fed in one day was 148. Experiments reported here using a larger subspecies of *Triatoma protracta* indicate larger volumes of blood consumed in toto and for all stadia.

A wild ♀ *Neotoma fuscipes* captured 1 August 1970 in a horse barn in Juniper Hills, northern Los Angeles County, California, was transferred to the Los Angeles City College laboratory. It was fed water and rat chow with carrots, lettuce and Bermuda grass supplied at irregular intervals. Except for removal to hardware cloth cylinders for bug feedings, the wood rat was confined in a cage 28 × 21 × 22 cm resting on SAN-I-CEL bedding in an open cardboard box until released alive 13 August 1971 near the original site of capture. During this time 1789 *Triatoma protracta navajoensis* (513 ♂, 644 ♀ and 612 nymphs) fed on this wood rat at 39 different times at approximately weekly intervals. The largest number of bugs fed at one time was 201 on 9 September 1970, the smallest 13 on 12 January 1971, the average was 49.5 per feeding. Adult bugs averaged 30.1 per feeding, nymphs 15.6 at any one time. The 232.5 g weight of the wood rat before first feeding on 3 August 1970 did not indicate an abnormal size but on 17 August it weighed 248.5 g and on 24 August 269 g. One young born on 30 August was found dead. Weights before and after the 36 bug feedings after birth of the young averaged 218.5 g (range 209.5 to 230) before and 214 (207-

221.5) after feeding revealing an average weight loss of 4.5 g per feeding. Greatest weight loss from bug feedings was 12.5 g 11 January 1971, the smallest was 0.5 g 16 July 1971. Although most of the weight loss must have been from the obvious loss of blood, some would be due to natural metabolic processes.

I have used an engorgement formula of 5 quantities as follows: fully engorged, $\frac{3}{4}$, $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{4}$. The formulae for the 1789 bugs fed were as follows: 1177 adults (790:full, 133: $\frac{3}{4}$, 128: $\frac{1}{2}$, 61: $\frac{1}{3}$ and 65: $\frac{1}{4}$); 349-5th instars (54-60-72-102-61); 151-4th instars (28-19-37-41-26); 74-3rd instars (6-7-11-33-17); 27-2nd instars (7-3-5-8-4) and 11-1st instars (8-0-3-0-0). *Triatoma* classified as full or $\frac{3}{4}$ were successful in molting so as noted above 114-5th, 47-4th, 13-3rd, 10-2nd and 8-1st instars molted in the laboratory. The 923 engorged adults produced numerous eggs after feeding.

Xenodiagnosis for Chagas' trypanosome was negative in 65 *Triatoma* (3 ♂, 5 ♀, 54-5th and 3-4th instars) examined in August 1970.

Laboratory temperatures at the time of 27 feedings averaged 23°C, the range being 19° to 29°C. Exposure times for *Neotoma* for 36 feedings varied from 60 to 390 min, the average being 168. Degree of irritability of the rat in the hardware cloth feeding cylinders may be indicated by the number of fecal pellets released during feeding. Extremely nervous rats may defecate more frequently. This ♀ *Neotoma* was remarkable in releasing only 6 pellets during the 39 day-time feeding exposures.

One 85.5 g ♀ *Neotoma fuscipes* was killed 13 June 1968 by exposure to the feeding of 14 ♂ and 40 ♀ *T. p. navajoensis*. Weight loss was 6.5 g, exposure time was 240 min and there were no fecal pellets in the feeding chamber. Linsdale and Tevis (1951, *The Dusky-footed Wood Rat*, U. C. Press, Berkeley) noted that wood rats being handled released fecal pellets as a sign of nervousness. They reported that pellets were released at night when the wood rats were active and one female studied for 24 days averaged 124 pellets per 24 hour period (range 7 to 208).

One 94 g ♂ *Neotoma fuscipes* was killed 13 June 1968 by the feeding of 33 ♂ and 19 ♀ *T. p. navajoensis* and 10 ♂, 2 ♀ and 1-5th instar *T. rubida uhleri*. Weight loss was 8.5 g, exposure time 150 min and there were 27 fecal pellets released.

Wood (1947, *Bull. So. Calif. Acad. Sci.* 46:144-155) reported survival of albino *Rattus norvegicus* to feedings of 130 *Triatoma* over 7 hours, 168 over 3.4 days and 317 over 59 days. Recently, one 305 g ♂ CFN (Carworth, Inc.) albino *Rattus norvegicus* survived the feedings of 4 ♂, 97-5th, 84-4th, 12-3rd and 1-1st instar nymphs of *T. p. navajoensis* on 13 August 1969 and 38 ♂, 62 ♀ and 19-5th instar nymphs of *T. p. navajoensis* and 2 ♂ and 5 ♀ *T. rubida uhleri* on 18 August 1969. Weight losses were 38 and 27 g, exposure times 510 and 360 min and pellet counts were 12 and 34, respectively. Another 358 g ♂ CFN rat survived the feeding of 64 ♂ and 41 ♀ *T. p. navajoensis* on 11 September 1969. Weight loss was 15.5 g, exposure time 180 min, and pellet count 15.

The capability of wood rats in providing blood meals for numerous adult and 5th instar *Triatoma* is important in replenishing stocks of bugs in nature. Recent experiments with *Peromyscus* also verify a supporting role of these mice as hosts for early instars of *Triatoma* (unpublished data).

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